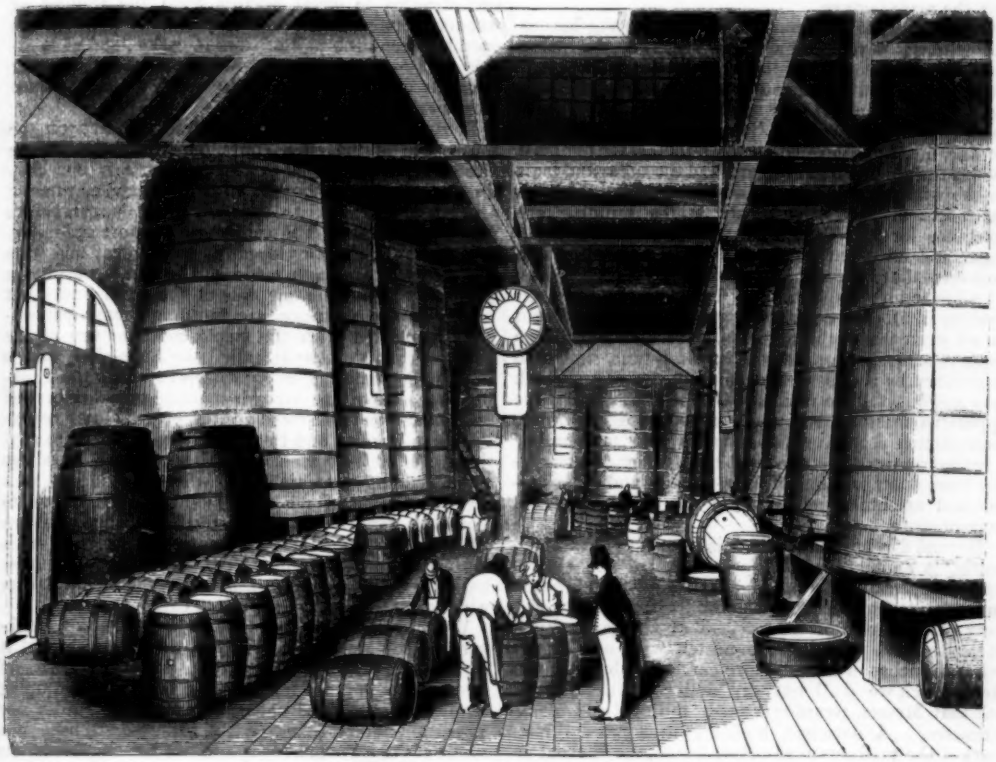
A DAY AT A VINEGAR AND BRITISH-WINE FACTORY.



['Sending-out Warehouse.'—Beaufoy's Vinegar-Works.]

THERE exists between the apparently dissimilar liquids *wine*, *spirit*, *beer*, and *vinegar*, a connexion little supposed by the majority of those who use them. Who would expect, unless he had attended somewhat closely to the matter, that the same corn which yields our quartern loaves may be made to yield spirit, and beer, and vinegar, by particular processes? Or that wine, cyder, beer, malt, sugar, and molasses, are all capable of yielding—and many of them are actually made to yield, in manufacture—that very distinct and peculiar liquid, vinegar? These are remarkable instances of vegetable chemistry, or of the changes which heat and other agents produce in vegetable substances. The full explanation of all these changes forms one of the most difficult branches of science; but the manufacturing arrangements are capable of being described in a general manner, without involving the delicate and complicated reasonings of the chemical philosopher. Having, in connexion with two of our former "visits," been enabled to describe the brewing and distilling processes and arrangements whereby beer and spirits are produced, we may now appropriately notice in a similar manner the Vinegar manufacture. It happens, too, that the firm who have liberally afforded the facilities for this purpose, viz., Messrs. Beaufoy of South Lambeth, are not only malt-vinegar makers, but also manufacturers of "Sweets," or as they are more generally termed "British Wines." Thus the same visit will enable us to gather a little information respecting the production of wine.

The vinegar-manufactories are but few in number. There are reasons, applying to these establishments as well as to porter-breweries and distilleries, why competition cannot be carried to so great an extent as in smaller undertakings. The "plant," or assemblage of apparatus, is very costly, and the skill required in the manufacture considerable. In a Report presented by the Commissioners of Excise Inquiry a few years ago, it was stated that the number of vinegar-makers in the United Kingdom is forty-eight.

Of the five principal vinegar-works in the metropolis, four are situated on the Surrey side of the water. Messrs. Beaufoy's establishment formerly stood near where the southern approach to Waterloo Bridge occurs, and was removed thence to Vauxhall in consequence of the building of the bridge. The present works are located in South Lambeth, between Vauxhall and the Clapham Road, and occupy a considerable area of ground. In this as in most other large works, the entrance gates open into a court-yard or area, portions of which are occupied by buildings wherein the manufacturing processes are carried on. Glancing along the left boundary of the court, we see, in the first place, an excise-office, fitted up for the convenience of the officers always more or less in attendance at a vinegar-factory (as in distilleries, soap-works, glass-works, &c.), by whom the amount of duty accruing on the manufactured product is ascertained. Beyond this is the 'shipping department,' or counting-house for the management of all matters connected with the coasting trade and the reception of materials; and in front is a weighing-machine. Adjacent to this is the 'chemical-room,' for the prosecution of experiments, and the analysis of liquids, arising out of or connected with the

operations of the establishment. Ranges of stabling occupy a further portion of this line of buildings; and the remainder consist of fermenting-rooms connected with the manufacture.

On the right of the court-yard are counting-houses and offices; beyond which the width of the court greatly increases. Immediately in front is the main building wherein the manufacture is carried on, and the successive stories of which exhibit a very varied assemblage of apparatus. Beginning at the top floor, we find this appropriated as store-rooms, for the malt used in the vinegar manufacture, and the sugar and fruit for the wine manufacture. In various rooms and compartments of the upper part of the building are machines for grinding and crushing malt, fruit, and sugar, and all the arrangements antecedent to what we may term the *chemical* portions of the several processes. At a lower level we find, from the numerous pipes extending in all directions, that liquids are here brought to act upon the dry ingredients. Here, too, are large coppers or boilers for hot water; mash-tuns, similar to those used by brewers; and conduits for liquids both into and out of these vessels. On the ground-floor the apparatus marks a still more advanced stage of the manufacture; here are 'under-backs' and 'jack-backs,' a refrigerator, or cooling-machine, a range of fermenting tuns, another range of wine-presses, and other vessels and machines pertaining to the two branches of manufacture.

Beyond this building, which is known as the 'Brew-house,' is another called the 'stoves,' or the 'stove-room,' kept carefully closed on all sides, and brought to a considerable heat within, for the furtherance of a very delicate part of the process of vinegar-making. Near this are buildings connected with one or two other branches of manufacture carried on by the same firm, which we shall not here notice further than to say that Messrs. Beaufoy are also 'millers' and 'drug-grinders.' A detached building in a more remote part of the yard serves as a store-house, the internal arrangements of which exhibit a specimen of very careful and minute classification. It is a feature in the establishment to make and repair on the premises as many of the implements and apparatus employed as possible. Hence a considerable quantity of materials is always in requisition; and these are under the especial control of a store-keeper. The whole of the buildings of the factory are classified into certain departments, each of which is placed under distinct superintendence; and the heads of the departments are charged with the quantity of stores and materials supplied by the store-keeper. The weight and number of all stores supplied being entered in a book, as well as the department to which they are supplied, the principals can thus at any time ascertain the amount of consumption in any one department. Lead and colours, brushes and pots, for plumbers and painters; nails and screws, &c. for carpenters; hoop iron for coopers; various tools and implements for smiths—indeed materials and tools for half a dozen different trades, are here congregated. We have on more than one occasion had to notice a similar arrangement in large factories, where a well-planned system of economy leads to the employment, within the establishment, of a number of artisans not directly concerned with the manufacture carried on. We may in particular refer to the hat-factory described in No. 567, where a smithy, a carpenter's shop, a turner's shop, all of large dimensions, formed part of the premises—not for making a hat, but for furnishing some of the appliances whereby a hat is made. All this is regulated by a well-known principle in the division of labour, which can only be developed where a large number of persons is employed.

Behind the store-house, and extending to a considerable distance, is the *vinegar-field*, a remarkable feature in most vinegar-works. Here the eye glances over many hundreds of casks, all ranged in parallel rows, and elevated to equal heights from the ground on wooden bars resting on brick piers. A pathway lies open between each pair of rows of casks; and at intervals in these paths are openings or valves, forming channels of communication, to which we shall allude more particularly hereafter.

Returning from the vinegar-field, we find on the south side of the open court the workshops for the various artisans alluded to above. There is one shop for blacksmiths, another for millwrights and engineers; another for plumbers, a fourth for carpenters, a fifth for wheelwrights. The cooperage is more extensive, for all the casks employed in the vinegar and wine departments are both made and repaired within the premises. On the same side of the open court, but nearer to the entrance, are buildings more particularly connected with the staple manufacture of the place. One of these is called the *Rape-shed*, and is filled with numerous bulky vessels in which the finishing processes of the vinegar-manufacture are carried on; indeed many of these vessels bear a closer resemblance to Barclay and Perkins's beer-vats than to anything else we have seen. Another of these buildings is the 'sending-out warehouse,' where the vinegar, after the completion of the manufacture, is consigned to store-vats ranged round the wall, and thence drawn off into casks for sale. The interior of this building is represented in our frontispiece. A somewhat similar building is the *wine store-warehouse*, where the British wines are stored, and drawn into casks.

We may finish our tour of the premises by remarking that the water required for the establishment is furnished by an Artesian well; and that there are three steam-engines for pumping the water, pumping the liquids in various stages of preparation from one vessel to another, grinding the malt, &c. There is a range of waggon-sheds too; and two fire-engines for the protection of the premises. The large open areas of the court and the vinegar-field, with the various buildings surrounding them, together occupy about eight acres.

It may now be well, in attempting to describe the operations carried on in these buildings, to keep them wholly separate, and to offer what we have to say concerning vinegar, before we speak of British wine.

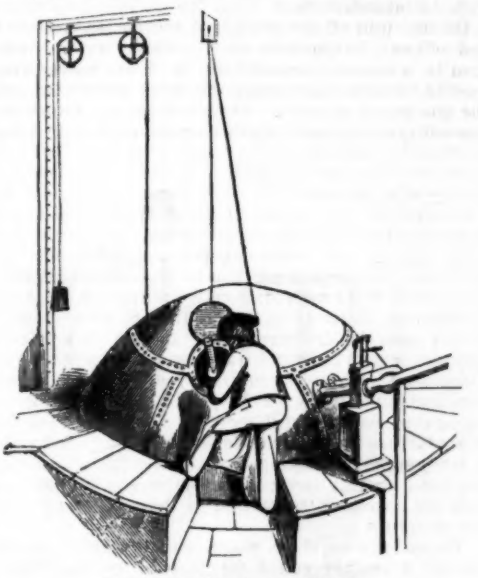
THE VINEGAR MANUFACTURE.

At the beginning of this paper it was stated that vinegar may be produced from many substances apparently wholly dissimilar. It is not only that they *may* be, but they *are* so in practice; for one manufacturer uses one ingredient, one another. Messrs. Beaufoy's is a *malt*-vinegar factory, where the vinegar is produced from precisely the same substance as the Highlander makes his whiskey. The theory of fermentation is one of the most refined points of scientific investigation; but it may be remarked, as a general clue to the apparent discrepancies in the materials of the vinegar manufacture, that alcohol, or spirit, is capable of being distilled from sugar, from fruit, from grain, and other vegetable substances; and that whatever yields spirit, may also be made to yield vinegar, by a different mode of procedure. Indeed the acetous fermentation, whereby vinegar is produced, follows very closely on the vinous, whereby spirit results; and it is often difficult to stop at the one and prevent the occurrence of the other. When we hear of 'sour' beer or 'sour' wine, we may regard these as instances that the acetous fermentation has commenced, or that our beer or wine actually contains some vinegar; indeed the French name, *vin aigre*, points significantly to one source whence the acid is produced.

Dismissing any discussion of the question why one manufacturer selects one ingredient and one another, we proceed to the details of the malt-vinegar manufacture, as exemplifying most of the principles involved. Malt, it perhaps need hardly be observed, is barley brought to a particular state by heat and moisture. The process of malting converts some of the starch contained in the barley into sugar, and facilitates the similar conversion of a further portion. This conversion into sugar, called the 'saccharine fermentation,' is one of the important steps in the preparation of beer, of ale, of whiskey, and of malt-vinegar: in all of these it is requisite that the starch of the grain be converted into a kind of sugar; for it is from this sugar that the vinous fermentation produces alcohol, the parent of vinegar. Hence the early processes in an ale-brewery, a malt-distillery, and a malt-vinegar factory, are very similar.

The malt is brought to the vinegar-works which we are describing, and hauled up out of the waggons into the upper floors of the brewhouse. Here openings placed in different directions allow the malt to be poured down into large bins, from whence it is removed when a brewing is about to take place. (Vinegar-makers and distillers, as well as ale and beer brewers, give the name of 'brewing' to the extraction of a saccharine liquor from malt.) The quantity required for one brewing being measured out, and taken from the bins in sacks, it is poured through 'hoppers,' or funnels at the top of the grinding apparatus, whereby the malt is reduced to meal. The apparatus consists of both the kinds used for such purposes, viz. mill-stones and crushing-rollers, either or both of which can be employed as may be deemed best. In the one case a flat circular stone rotates and crushes beneath it the malt which flows between it and a lower fixed stone. In the other case the malt, after flowing through a shoot or trunk from the hopper, falls on a wire grating, where it becomes separated from any impurities with which it may be mixed. It then passes between two cast-iron rollers rotating nearly in contact, and becomes thus crushed to fragments. An ingenious contrivance, invented by Captain Huddart, is adopted for yielding to any hard substance which may get between the rollers with the malt, without injury to the apparatus; it acts on the principle of stopping the revolution of the roller altogether until the cause of obstruction is removed.

When the malt is crushed or ground, it falls through a hose or trunk into the mash-tuns in the floor beneath. These mash-tuns are similar in principle to those used at the great breweries and distilleries, but smaller in size. They are circular vessels with a central 'stirrer,' or instrument for keeping in constant agitation the ingredients which may be in the tuns; the stirrer being worked by a steam-engine. It is in these vessels that the 'saccharine fermentation' goes on, or the extraction, by the action of hot water, of a sweet or mawkish substance from the malt. It is this sweet principle which subsequently yields to the brewer his beer or ale, to the distiller his spirit, and to the vinegar-maker his vinegar; and it may well be supposed that every precaution is taken, and every investigation made as to the extraction of the greatest quantity and the most fitting quality of this important agent. The quantity of water required with a given quantity of malt, and the temperature at which the water is used, vary in each particular branch of manufacture, according to the strength of the 'wort' required. The arrangements at Messrs. Beaufoy's for adjusting these elements are very exact and ingenious. The hot water is let down upon the malt in the mash-tun when at the proper temperature; and in order to adjust this, the foreman of the brewhouse ascertains, by the aid of a thermometer, the temperature of the water, through a temporary opening in the upper part of the boiler. The arrangements at this spot are shown in the annexed cut, where is also

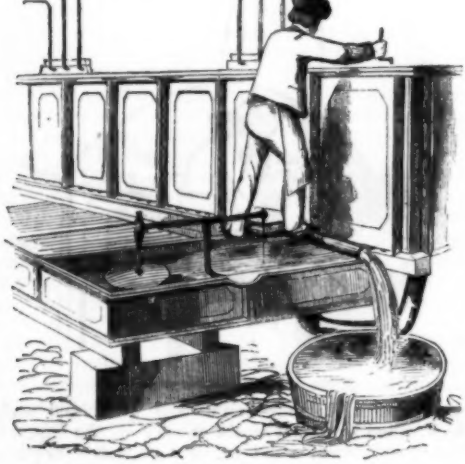


[Upper part of the Copper or Boiler.]

represented a balance-weight and graduated scale, which, aided by a float on the surface of the liquid in the copper, indicates the number of inches depth of water therein.

When the water has acted on the malt for a certain period, and been constantly stirred with it, the liquor receives the name of *wort*, and is allowed to flow through pipes out of the mash-tuns into a large cast-iron vessel called an 'underback,' measuring probably twenty-four feet in length, by eight in width. This is merely a general receptacle for the wort, into which the latter is collected when the mashing is completed. Then ensues the process of *cooling*, one which exhibits many remarkable differences as effected in different establishments. In our descriptions of a great brewery and of a distillery, we had to speak of large, open, shallow, airy rooms, called 'coolers,' or 'cooling-floors,' whereon the wort was poured in a thin layer to be cooled by the access of air on all sides. Such was formerly the mode adopted at the vinegar-works now under description; a surface of nearly twenty-three hundred square feet having been appropriated to this purpose. This mode has however been superseded by another, in which one hundred square feet of surface is made to yield the effects formerly wrought by more than twenty times that extent. There is a vessel now employed for this purpose, called a 'refrigerator,' which acts on the following principle:—The hot wort is allowed to flow out of the underback into an oblong vessel, and out of this latter into another receptacle in the same part of the building. A continuous pipe, between three and four hundred feet in length, passes backwards and forwards through the oblong vessel, and through this pipe cold water is continually flowing from an Artesian well two hundred feet deep. There is a constant current of wort from east to west through the vessel, and a constant current of water flowing from west to east through the pipe; and it is not difficult to see that this must have a tendency to cool the wort. There are four adjustments by which the wort may be made to leave the refrigerator at any desired tempe-

rature, viz.. increasing or decreasing the rapidity of the entrance of the wort, the exit of the wort, the entrance of the water, and the exit of the water. As the cold water travels onward through the convoluted pipe, it abstracts heat from the surrounding wort; when the water flows quickly, the wort is cooled to a lower temperature than when it flows more slowly; and by a simultaneous adjustment of the valves connected with the wort-vessel, the flow of the wort can be also duly regulated. The annexed cut represents the refrigerator, at the end where the wort enters, and



[Underback and Refrigerator.]

where the water leaves the pipe after having performed its office; by the side of the refrigerator is seen the 'underback.' Not only does this method require much less room than that of the 'cooling-floors,' but the time employed in cooling a given quantity of wort is reduced to one-third, and the manufacturer is rendered independent of fluctuations of the weather; for, unlike atmospheric agency, his cooling agent is brought from a source two hundred feet below the level of the ground, and is nearly equable in temperature at all times. It may be as well to remark that this method of cooling is the reverse of that adopted in the worm-tub of a distillery: in this latter case the hot liquid, or rather vapour, passes through the pipe contained in the vessel, and the cold water flows through the vessel itself; but in the vinegar-refrigerator the cold water passes through the pipe, and the hot liquid through the open vessel. The distiller's worm is not, in fact, a *refrigerator*, it is a *condenser*; and the condensed vapour must not be open to the atmosphere.

The reader will bear in mind that the wort thus produced is in principle precisely the same as that made by the ale and beer brewer and the distiller, differing only in saccharine strength. It undergoes, too, the same process of fermentation, subject to those limitations which may be required by the nature of the manufacture. From the refrigerator which we have just described, the cooled wort flows into a large circular receptacle sunk in the ground, called the 'jack-back,' from which it is pumped up into vessels, called 'fermenting-tuns.' Here we may remark, that a valuable system of combination or centralization is observed in the arrangement of the conducting pipes in this establishment. There are here and there large vessels which serve as a kind of centre, from each of which openings lead to several other vessels, each opening being governed by a particular valve or cock. For instance, the liquid which in various processes is contained in the 'jack-back,' has sometimes to be transferred to the fermenting-tuns, sometimes to a large back or cistern at the top of the building, and sometimes to the copper; yet there are not three openings from the jack-back for these different purposes, but one, which leads to a three-barrelled pump, whose barrels are marked respectively, 'tuns,' 'back,' 'copper;' so that by turning one of three handles, the liquid can be conveyed to one of these vessels. Again, the back just alluded to is placed in connexion with several large vessels in different parts of the premises, to any one of which its contents can be transferred by simply turning a handle. There is one of the buildings in which a hexagonal table is seen, under the bed or surface of which are six valves or cocks, all opened and shut by one key. Each one is inscribed with the name of some one vessel or building, with which it is placed in connexion by an extensive series of under-ground pipes; and the superintendent of this small piece of apparatus can in fact control the flow of the liquid under manufacture in almost every direction. The advantages derived from this method are such as generally result from a union of centralization with classification.

To describe what goes on in the fermenting-tuns is no easy matter, as it involves the little-understood process of the vinous fermentation. The brewer, the distiller, and the vinegar-maker alike expose the wort to the action of yeast and an elevated temperature; but they require very different degrees of the alcoholic development. The brewer, when his wort has fermented, gives the name of *beer* or *ale*, to the product, according to the manipulation of manufacture; the distiller calls his fermented wort by the name of *wash*; while the vinegar-maker applies the name of *gyle* to the fermented wort which he uses. It is very proper that distinct names should be thus used (although those actually employed may seem somewhat unmeaning), for the liquids are by no means the same, although all produced by vinous fermentation from sweet wort.

The fermented wort, or, as we shall now term it, the *gyle*, is transferred from the fermenting-tuns to other vessels, where it leaves a deposit or sediment, which is a kind of acetous yeast; and being thence allowed to flow into the jack-back, it is pumped up one of the branches of the three-barrelled pump into the large vat above. From this, as a centre, the gyle is allowed to flow into casks, where it assumes the form of vinegar, a process which is in every respect remarkable. The change here indicated is brought about in two methods exceedingly opposite in their general character. In the one case the casks containing the gyle are placed in close rooms heated to a high temperature; in the other they are ranged in rows in an open field, where they remain many months. Different as these methods seem to be, yet the effect produced is precisely the same, viz. the conversion of the gyle into vinegar by the internal process of acetification. In what manner the oxygen of the air and the heat of the stove-rooms work this change, is as much a chemical difficulty as the process of fermentation generally. As regards the convenience and interests of the manufacturer, both methods seem to have their advantages; for at the vinegar-works which we are describing both are followed, although the one occupies a very much longer period of time than the other. When the vinegar is to be acetified in the field, it must be made during the three spring months, and then left several months in the field.

This process of acetification is technically called

'stoving,' or 'fielding,' according to the method followed. In the first-mentioned case, the casks containing the gyle are arranged conveniently in three stove-rooms, which are closed and locked, and then exposed to a certain temperature till the acetification has been wrought. Two minutes' stay in one of these rooms is quite sufficient to convince a visitor that vinegar is in the act of formation, the suffocating acetous vapour being insupportable. The method of stoving is, we believe, generally adopted by the vinegar-makers of France, and appears to render the manufacturer more independent of the seasons than the field process.

The process of 'fielding' is much more visible, if we may use such a term, than that of 'stoving,' from the circumstances under which it is conducted. The casks, each of which contains rather more than a hundred gallons, are arranged in long parallel tiers, with their bung-holes open and uppermost. Beneath the path which separates every two rows of casks is a pipe, communicating with the 'back' at the top of the brewhouse; and in the centre of each path is a valve

[Vinegar-field—Filling the Casks.]

or cock opening into this concealed pipe. When the casks are about to be filled, a flexible hose is screwed on to this valvular opening, and the other end of the hose is inserted in the bung-hole of the cask. Then, as the reservoir of gyle is many feet above the level of the casks, the liquid flows by its own pressure through the underlying pipe and the hose into the cask. A man guides the hose in the manner represented in the preceding cut, and has sufficient length of hose to fill all the casks in one row, one after another.

Here the vinegar remains for several weeks, or even months, the bung-holes of the casks being covered with small pieces of tile or slate, which are removed when the weather is fine. The casks are examined twice every day; and if it happens that a shower of rain comes on suddenly while the bung-holes are exposed, nearly all the hands in the vinegar department are 'turned out,' to cover the casks as speedily as possible. The air effects the same object as the heat of the stove-rooms, but much more slowly. In both cases the gyle, or fermented wort, undergoes the process of acetification, whereby it becomes converted into vinegar. In those factories where the vinegar is produced from other substances than malt, the gyle is converted into vinegar nearly in the same way as in the present case, although the gyle itself is differently produced.

When the 'fielding' is completed and the vinegar is to be removed from the casks, the arrangements are managed in a very ingenious manner. A long trough or shoot is laid by the side of one of the rows of casks, into which the vinegar is transferred by means of a syphon, the shorter leg of which is inserted in the bung-hole of the cask. The trough inclines a little from one end to the other, the lower end resting on a kind of travelling tank or cistern; so that the vinegar from several casks is collected in one tank. From the tank a hose descends to the valve placed in the ground, and the vinegar is drawn, by steam-power in the adjacent buildings, from the tank into the hose, from thence into the valve, and then along an under-ground pipe, which terminates in one of the factory buildings. Thus the invisible moving-power is made to draw off all the vinegar from all the casks in succession. The travelling cistern, the syphon, the tank, the hose, &c., are transferred from row to row of the casks as fast as they are emptied. A portion of this operation is here represented.

[Vinegar-field—Drawing off.]

The vinegar, so far as acetification is concerned, is now finished; but there is a certain purifying or cleansing required before it assumes a marketable state. This purifying is, however, not always done immediately; but the vinegar is pumped from the casks into a 'back of communication,' a centre from whence pipes conduct the liquid to a number of store vats placed in the 'vat-warehouse.'

When the vinegar is to be clarified or 'brightened for sale, it is pumped from the store-vats into vessels which are in some respects the most remarkable employed in the vinegar manufacture, or rather the clarifying ingredient is a remarkable one. In a building called the 'rape-shed' are some enormous wooden vessels called 'rapes,' each of which is filled with a filtering ingredient also called 'rape.' This double em-

ployment of the same word seems rather absurd; but it is probable that the 'rape-vessels,' or the vessels containing 'rape,' became called 'rapes' for the sake of brevity; and for the origin of the name itself we may perhaps refer to the French word 'raffe,' connected with the process of 'raffinerie,' or refining. Leaving etymology out of the question, however, we may state that this rape consists of *raisin stalks and skins*, which seem to filter the vinegar better than any other substance hitherto employed. It would seem pretty evident that it is not a mere filtration which the vinegar undergoes, but that in percolating over and over again through the rape, it imbibes some quality which it did not possess before. Sometimes wood-shavings, sometimes straw, and sometimes tanners' spent bark, is employed as the filtering ingredient; but the refuse of raisins which have been employed in making wine is preferred to every other material. It is a matter of immense difficulty to collect the necessary quantity of this material to fill the bulky vessels; and when once collected, we believe there is no part of the vinegar-maker's apparatus on which he places so much value. We shall have a further remark to make on this subject in a future page.

Each 'rape,' or filtering-vessel, is fitted with a false bottom, on which the filtering medium is placed. Beneath this false bottom, and above the true bottom, is inserted a cock, which allows the vinegar to flow into a back or cistern. From this a pump elevates the liquid to the top of the vessel; and hence ensues a very curious circuit. The vessel is filled up with vinegar, which filtrates through the raisin-refuse into the space beneath, thence into the tank, thence through the pump to the top of the vessel, to recommence its circuit. Over and over again does this circuit proceed, the pump being kept constantly at work, and the vinegar incessantly in motion. If such a comparison might be permitted, we would liken the pump to a heart, which propels the liquid to the enormous lung—the rape—where it is purified, and then again returned to the heart. The filtering substance gradually, but very slowly, wastes away, and is renewed from time to time.

The vinegar by this process becomes transparent, or 'bright,' as it is technically termed, and is then pumped from the rapes into store-vats, where it is kept till required to be put into casks for sale, and the rapes are immediately filled up with an equivalent portion of fresh vinegar, so as never to leave the raisin-refuse idle. The vinegar-casks hold one hundred and sixteen, fifty, and twenty-five gallons respectively. Each cask is examined and gauged before being brought into the 'sending-out warehouse,' to see that it is sound and of proper dimensions. The warehouse is a large room lined on all sides by store-vats, from which the casks are filled; and on the days when these casks are to be sent off, the warehouse presents a very busy appearance, with coopers, porters, &c. ranging the casks, marking them, and consigning them to the waggons.

With a few miscellaneous remarks on vinegar we must pass on to the other object of our 'visit.' Vinegar is known by certain numbers, such as No. 18, 20, 22, and 24. These originally represented the number of pence per gallon at which the vinegar was sold; and although the price no longer accords with these numbers, the numbers themselves have been retained as symbols whereby a certain quality of vinegar may be known and designated. Vinegar pays to government a duty of 2*d.* for every gallon of 'proof,' proof being deemed that degree of strength which contains five per cent. of pure acetic acid, as ascertained by an instrument called an 'acetometer,' which acts on the principle of determining the specific gravity of the vinegar when saturated with hydrate of lime, and deducing the acetic strength therefrom. Vinegar varies considerably in its strength under different circumstances, and the duty paid always bears a strict relation to the strength: thus, if the quantity of pure acid in a gallon of vinegar be double of 'proof,' then it pays double duty, or 4*d.* per gallon; and so on. The strength of vinegar is more difficult to ascertain than that of spirit, for there is a kind of mucilage or extractive matter in it which increases its specific gravity, and which is very different in quantity at different times. Hence a given specific gravity will not, as in spirit, indicate the strength; and the test employed is the specific gravity *after* it has been saturated with hydrate of lime. Up to the year 1834 there were seventy-seven thousand dealers in vinegar in Great Britain, every one of whom was visited once a month, to see that he conformed to certain regulations, such as to make an entry of his premises, and not to send out any quantity of vinegar exceeding ten gallons without a certificate from a book provided by the Excise. The expense of thus making nearly a million visits in a year, and the utter uselessness of the system, led to its abandonment in 1834, on the recommendation of the Commissioners of Excise Inquiry. The quantity of vinegar made in the British Islands is about three million gallons a year, of which more than half is made by four London firms.

British Wines, or 'Sweets.'

The use of British wines, or, as they are sometimes called, 'home-made wines,' is of very limited extent; and it may perhaps hardly have occurred to the reader that the manufacture is carried on on anything like a considerable scale. Such is, indeed, the fact at the present day; but still there are circumstances attending the rise and growth of this branch of trade too curious to be passed unnoticed.

It is perhaps pretty generally known that nearly all foreign wines are made from the juice of the ripe grape, and that the variations in quality and appearance depend partly on the species of grape, partly on the soil where it is cultivated, partly on the state of the climate, and partly on the method of vintage. British wines, however, are made either from dried grapes, which come to us under the name of *raisins*, or from common English fruits. At first the name of 'sweets' was confined principally to the varieties of raisin-wine; but as English-fruit wine was equally subjected to duty, all alike acquired the name of 'sweets.' The Excise definition of sweets is, "All liquors made by infusion, fermentation, or otherwise, from fruit or sugar, or fruit and sugar mixed with other materials;" and until 1834, any person who had any such liquor in his custody, in quantity exceeding one hundred gallons, was deemed a maker of sweets for sale, and subject to Excise survey.

The rise of the British-wine trade was closely connected with the vinegar manufacture, and dates back to about a century ago. At that time—as Hogarth's print of 'Gin Lane,' and many other sources of information, amply attest—the scenes of drunkenness witnessed in the metropolis had reached a fearful extent. The legislature endeavoured by various means to give a turn to the public taste that might lessen the evil; and among other things they held out strong inducements for the manufacture of sweets, or home-made wines, for sale. For many years, however, although sweets had been reckoned among exciseable articles ever since 1696, the manufacture continued utterly insignificant.

It happened about that time that Mark Beaufoy, a member of the Society of Friends at Bristol, who had abandoned his original trade of a distiller from con

scientious scruples, arising out of the prevailing vice of the times, went to Holland to learn the process of malt-vinegar making, and on his return established a vinegar-factory on the site of the once-celebrated *Cuper's Gardens*, near the present southern end of Waterloo Bridge. The works grew in extent and in fame, and were visited many years afterwards by Pennant, who in his 'London' gives the following paragraph:—"There is a magnificence of business in this ocean of sweets and sours, that cannot fail exciting the greatest admiration, whether we consider the number of vessels or their size. The boasted tun at Heidelberg does not surpass these. On first entering the yard, two rise before you, covered at the top with a thatched dome; between them is a circular turret, including a winding staircase, which brings you to their summits, above twenty-four feet in diameter. One of these conservatories is full of sweet wine, and contains fifty-eight thousand one hundred and nine gallons, or eighteen hundred and fifteen barrels, of Winchester measure: its superb associate is full of vinegar, to the amount of fifty-six thousand seven hundred and ninety-nine gallons." The casks and hogsheads seemed to Pennant so minute after these, that he "imagined he could quaff them off as easily as Gulliver did the little hogsheads of the kingdom of Lilliput."*

But to return to the 'sweets.' Mark Beaufoy, in the endeavour to establish a malt-vinegar factory, had to encounter a great difficulty, viz. the want of '*rape*' wherewith to construct the filters to fine and flavour the vinegar. In Holland the vinegar-makers were supplied with the refuse from the raisin-wine manufacturers and raisin-wort distillers; but in England there was no source of the kind whence he could be supplied, and yet such a supply was indispensably necessary to the success of the process on the Dutch method. Under these circumstances he was constrained to purchase raisins, and after steeping them for the purpose of extracting the saccharine and mucilage of the fruit, the liquor was thrown away, and the rape alone (comprising all the solid parts of the raisin) reserved for use in the vinegar manufacture.

It happened, however, that Dr. Fothergill, the Quaker physician, became acquainted with this waste of raisin-juice, and, after demonstrating how wine might be made from it, advised Mark Beaufoy to commence it as a branch of manufacture. He did so, and entered his name at the Excise as a "maker of sweets," about a century ago. From that time, owing partly to the spur which one branch of manufacture thus gave to another, and partly to a wish in many quarters to substitute a milder drink for that which had produced such social evils, the raisin-wine trade rose into distinction and importance. The kinds of raisins he used were principally Smyrnas, Malagas, Lexias, Faros, and Cape de Verds; but in later years the manufacturers of sweets included the English fresh fruits among the materials whence they produced wine. For forty years the trade gradually extended; but in 1784 the minister of the day adopted a course which most seriously shook and injured it: this was by enacting that no dealer or vendor of *Foreign wines* should be allowed to have any *British wines* upon his premises or in his possession; the two trades (of vendors, but not makers) having hitherto been considered and conducted as one. This enactment arose out of certain excise regulations concerning foreign wines; but its effect on the sale of British wines was most marked.

* Pennant's 'London,' 3rd edit., p. 34. Wilkinson, too, at a later date, gave a representation and description of these premises, in the 'Londini Illustrata,' as they appeared before the removal of the establishment to South Lambeth in 1812, consequent on the preparations for making the southern approach to Waterloo Bridge.

In the year ending 5th July, 1784, previous to the new regulation coming into force, the duty charged upon sweets, in the London district only, was for 7000 barrels made by the firm of Beaufoy and Co., and about an equal quantity by the other makers who had by degrees entered the trade; whereas in the following year the quantity was only 241 barrels! The new act completely annihilated all the dealers, so far as this article was concerned, by rendering them obnoxious to heavy penalties; and the manufacturers had new connexions to seek for vending their produce. The blow once given, was never wholly recovered; for though the firm mentioned above paid nearly 10,000*l.* duty in 1813 on British wines, being the largest ever paid by one house in one year, yet the trade on the whole progressively declined, and was still further injured by the reduction of the duty on Cape wines some years ago. At length, by the year 1834, the duty became so small,—amounting to less than 3000*l.* per annum for the whole of the British Islands,—that the Commissioners of Excise Inquiry recommended it to be abolished altogether, as not worth the trouble and expense of collecting. British wines, therefore, are not now an exciseable article; and there will not in future be data whereby to judge whether the manufacture increases or diminishes.

As a notable branch of trade, we may thus consider that the British-wine manufacture has gone through the phases of rise, zenith, and fall, within about a century; although it may perhaps happen that the removal of the duty will give another impulse to it. It will still continue to be an interesting though not an extensive branch of English manufacture; and those who are not so well provided with the good things of life as to have the real juice of the grape at their table, will probably still, to some extent, look to a substitute less costly than foreign wine and less injurious than ardent spirits.

The manufacture of 'sweets' is one partaking of fewer processes than that of vinegar, and may be described without much difficulty. If we take the term 'sweets' in its fullest extent, so as to include all the varieties of British wine, then we shall at once state that the only variety deemed deserving of description here is that of *raisin-wine*, to which the manufacture was in the first instance confined. All the kinds made from English fruits, such as 'currant-wine,' 'raspberry-wine,' 'elder-wine,' &c., are such household acquaintances, that we need not trace their birth and parentage; every 'Cook's Oracle,' and 'Complete Housewife,' and 'Kitchen Manual,' 'The Cook,'* and 'Useful Receipt Book,' teaches us how to make these wines; and the difference between their methods, and the mode pursued by those who make the wines for sale, lies rather in the quantity operated on, and the size of the vessels, than in the routine of processes. Let us then glance at the method of making the wines from foreign dried fruits, as practised at this establishment.

The dried fruits or raisins (frequently, but erroneously, called *plums*) which result from the different kinds of grape, do not lose all the vinous quality of the fresh fruit, although much seems to be lost in the process of drying. Nearly all the grapes thus prepared are brought from the countries bordering on the Mediterranean, and are generally named either from the places where they are produced, or those whence they are imported; but in some cases, such as 'muscatels,' 'blooms,' 'sultanas,' 'raisins of the sun,' and 'lexias,' the name is derived from the quality of grape or the mode of preparation. The most simple mode of preparation in the grape-countries is to dry the fruit, after being cut when fully ripe, by exposure to the heat of the sun on a floor of hard earth or stone. An-

* Published by C. Knight & Co.

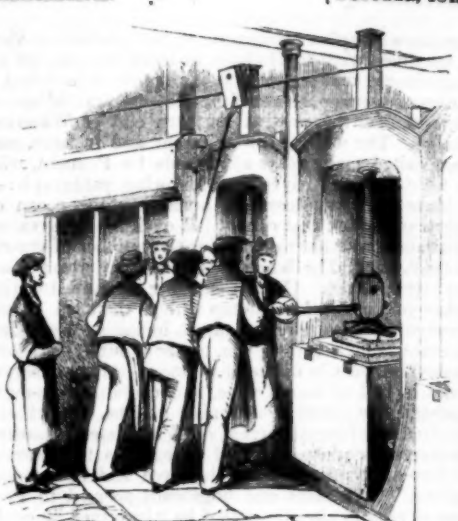
other method is to cut the stalk halfway through when the grapes are nearly ripe, and leave them suspended till the watery part is evaporated; the flow of sap is in a great measure prevented from entering the fruit, in consequence of the incision, and whilst evaporation continues to go on undiminished, the grape necessarily becomes dried. Some sorts are prepared by dipping the grapes in a ley, and afterwards drying them in the sun; the ley being formed of water, wood-ashes, and a small portion of oil of olives. Inferior raisins are dried by the artificial heat of an oven.

The raisins acquire very different qualities according to these modes of treatment; but the wine prepared from them by the British manufacturer of 'sweets' may be spoken of in general terms, without reference to specific differences, further than to say that the 'Lexias' produce a dry wine, the 'Denias' a sweet wine, the 'Black Smyrnas' a strong-bodied wine, and the 'Red Smyrnas' and 'Valencias' a rich and full wine. The time when the importer lays in his store of dried fruit is from Michaelmas to Christmas; and from thence to spring, or in short during the cool weather, is the principal time for making the wine.

The fruit comes into the hands of the wine-maker in three different kinds of packages—baskets, casks, and boxes—according to the quality of the fruit; but in general the raisins are packed closely together, and form a hard mass. These masses are in the first instance laid on a floor and beaten with wooden mallets, as a means of separating the raisins one from another. Sometimes the agglomeration is so close, that the mass has to be passed between rollers before the separation can be effected. The separate raisins—or rather the small masses, for the individual separation is not yet effected—are steeped in a vessel with a quantity of water, where they stand until all the fruit, by being swelled with the water, rises up and floats on the surface.

When the fruit has risen to the surface of the water, a portion of the latter is drawn from the vessel, by which the mass of fruit necessarily sinks to a lower level. A perforated board or floor is then laid on the top of the fruit in the vessel, and kept down by a weight; and upon this is pumped the liquor which had been previously drawn from the vessel. As the weight keeps the board down, and the board keeps the fruit down, it follows that the fruit has a body of liquid above as well as below it; while the perforations in the board allow the liquid to percolate through to the fruit. This process is repeated from time to time, by drawing off the liquid from beneath the fruit, and pouring it in above, by which all parts of the fruit become equally affected. The extraction which is brought about during this process probably begins at the moment when the fruit has lightness enough to float on the surface of the liquid, and continues throughout the process.

When all the vinous and saccharine matters have been extracted from the fruit by this process, the liquid is drawn off into separate vessels. The fruit, however, is not wholly exhausted by this drawing-off, for a considerable portion of the liquid is absorbed by and mixed up among the spent fruit. To recover this is a point of importance; and the action of pressure is here brought into requisition. In one of the rooms of the factory is a powerful hydraulic press, and also a range of screw-presses, the former or the latter being used according to circumstances. Our concluding cut represents one of these presses while being worked, by which it will be seen that considerable power is applied. Each press consists of a kind of cubical box, two or three feet square, into which a strong square board or presser works, being attached to a screw above, and the screw being turned by capstans. In



[Wine-manufacture—Fruit-pressing.]

the first instance a man gets into one of the steeping-tuns, and lades out the spent fruit into baskets, which are carried to the press-boxes and there thrown in until the box is full. A powerful iron bar is inserted in a hole in the screw-shaft, and is then used, capstan-like, to turn the screw and press the fruit, half a dozen men being thus employed. Sometimes the aid of a powerful windlass is employed to turn the screw; and the pressure thus exerted is so great as to reduce the fruit to one-third of its former bulk.

The liquid which is thus obtained is added to that which was drawn off from the steeping-vessels; while the spent fruit, now pressed almost dry, is so far from being valueless, that it constitutes the article *rape*, so important to the proceedings of the vinegar manufacturer. The steeping is not the only process which is carried on in the large vessels; for after the fruit has been moistened and the saccharine qualities extracted, a kind of fermentation is induced by a leaven or yeast contained in the fruit itself; and it is principally to regulate this fermentation that the liquid is passed so frequently through the mass of fruit. In fact the liquid which is drawn off from the vessels is not merely raisin extract or juice; it is wine in a crude state.

The wine is pumped from the fermenting-tuns into other vessels in the 'wine store-warehouse,'—a large building lined on every side with vats, tuns, and casks of various sizes. Here it is subjected to repeated 'rackings,' by which everything that is capable of being precipitated is separated from it and falls to the bottom of the vessels. Here too all the processes of sweetening, and 'fining' with isinglass, &c., according to the different kinds of wine, are carried on, until the wine assumes the form in which it is sold. It is stored in vats, from which it is drawn into casks for sale to the dealers. There is no 'bottling' department at this factory, the wine being sold 'in the wood;' and the dealer separates it into the smaller portions which find their way into the hands of the consumer.

Here we take our leave of this region of sweets and sours, and thank the proprietors for their courtesy. We have thought that the connexion existing between these two branches of manufacture, both in history and in practice, would render it advantageous to treat of them both in one article, and the firm to which the foregoing details relate is the only single one which affords the facilities for so doing.